

Connecting the BrainMap database to the World Wide Web

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INTRODUCTION

The BrainMap database¹ was introduced to provide an environment for the meta-analysis of human functional neuroimaging data. The data is stored in a hierarchy with several levels of detail, comprising of the paper-level, a level with the according experimental information, and at the lowest level the brain coordinates activated by each experiment. The database can be searched using a variety of queries, including citational and behavioural as well as location and protocol criteria. The resulting data can be displayed either textual (for citational and experiment-related information) as well as graphically (plots of coordinates into stereotactic space).

The BrainMap database uses a Unix-based workstation (Sun SparcStation 20) as a server running the Oracle relational database management system. The main client software to access the database through the Internet is a Macintosh SuperCard program. To allow different computer platforms to access the database, a World Wide Web (W3)² client was implemented in fall 1995.

METHODS

As the first step a W3-server-daemon was installed on the database server workstation. The Netsite server software (Netscape Communications) was chosen because it provides scalability and simplified administration, but in principle the client could be installed on any server that supports the 'common gateway interface'-standard (CGI)³. The programming language chosen for the project was Perl (version 5) which allows rapid prototyping and easy integration into the W3 environment. Access to the Oracle database was gained using the PerlDB language extensions⁴. The client was implemented as a single Perl script invoked by the W3-server upon user-request.

RESULTS

The W3-client⁵ provides most of the features found in the Macintosh client with a user interface adapted

to the specific necessities and opportunities of the W3. The current version does not support graphical input and display of search coordinates; all other query and display functions have been implemented. Using interactive forms, search criteria can be added to a query and combined using boolean operators and brackets. Search results are displayed according to the hierarchy levels of the database (list of papers matching search criteria, according experiments, activated locations). In addition to the features of the Macintosh client, queries and search results can be saved in the database for later perusal. Different levels of access to the database are managed using password authentication. Guest access without password is granted to the full query capabilities; display, however, is limited to the first hierarchy level. The client has been online since September 1995 and is currently serving an average of 137 requests per day with more than 350 registered users.

CONCLUSIONS

The W3 client has opened access to the BrainMap database for users of many additional computer platforms while being fully integrated into the existing structures. Since going online the client's usage has increased steadily. Future extensions (possibly utilizing the Java programming language) will allow the client to offer the full graphical functionality of the BrainMap database.

References

1. Fox PT, Lancaster JL. Neuroscience on the net. *Science*, 1994;266(5187):994-996
2. Berners-Lee TJ, Caillau R, Luotonen A, Nielsen HF, Secret A. The World Wide Web. *Comm ACM*, 1994;37(8):76-82
3. <http://www.w3.org/pub/WWW/CGI/>
4. <ftp://ftp.demon.co.uk/pub/perl/db>
5. <http://ric.uthscsa.edu/services/>

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